

REMARKS/ARGUMENTS

Prior to entry of this Amendment, claims 8-16 and 24-31 were present for examination in this application, claims 17-22 having been previously withdrawn and claim 23 having been previously canceled. Claims 8 and 27 are amended by this paper, and no claims are canceled or added. Therefore, claims 8-16 and 24-38 are now present for examination, and claim 8 is the independent claim. No new matter is added by these amendments.

Applicant respectfully requests reconsideration of the application as amended in light of the following remarks.

Interview

Applicant thanks the Examiner for the courtesy of the telephone interview conducted October 20, 2010 with Applicant's undersigned representative. Also present during the interview was Examiner Ula Ruddock.

During the interview, it was agreed that the rejections of claims 28 and 32-38 under 35 U.S.C. § 112, first paragraph would be withdrawn in view of the support in the specification pointed out in the remarks below. It was also agreed that the rejection of claim 27 on this ground would be overcome by omitting the word *common* from the claim.

Regarding the rejection under 35 U.S.C. § 102, the Examiner maintained that the term *block* had been properly interpreted, and suggested amending the claims to recite some other distinguishing property of the thermal modules, for example incorporating claim 30 or 31 into claim 8. It was agreed that this change would distinguish over the reference of record, but no agreement was reached on the ultimate patentability of the claims.

Applicant's representative proposed amending the claims to recite that the blocks are "substantially rigid". The Examiners agreed this would overcome the current rejection, but questioned whether the specification supports this approach. As is explained below, the specification provides ample implicit support for reciting substantially rigid blocks.

Rejections Under 35 U.S.C. § 112

The Office Action has rejected claims 27, 28, and 32-38 under 35 U.S.C. § 112, first paragraph, as allegedly failing to comply with the written description requirement. (The

Office Action also indicates that claim 29 is rejected on this ground, but provides no discussion of the rejection. Applicant believes that claim 29 was not intended to be included in the rejection.)

Claim 27 is amended as suggested by the Examiner to overcome the rejection.

Applicant respectfully traverses as to claims 28 and 32-38.

Claim 27

Claim 27 is amended to delete the word *common*, and now recites *an inlet through which the second fluid is received for distribution to all of the second thermal modules*. Input port 9 (as numbered in original Figure 1) is connected by passages to all of the second thermal modules, and is thus such an inlet.

Claim 28

The Office Action alleges that the limitation *both fluids are liquids* is not supported by the disclosure as filed. Applicants respectfully disagree. In support of the rejection, the Office Action argues that “the original specification fails to provide support that at the time of the invention applicant has possession to every possible kind of heat transfer liquid such as liquid metals, ammonia or methyl alcohol to name a few.” (Office Action p. 3). Applicant notes that the original claims as filed recited “fluids or gases” as possible working fluids. (Original claims 2, 4, 5). The term *liquid* is completely encompassed by the previously recited “fluids”, and Applicant’s original disclosure discloses water, which is a liquid. Applicant respectfully submits that claim 28 is adequately supported by the disclosure as filed.

Claims 32 and 38

The Office Action alleges that the limitation *at least two of the plurality of second thermal modules reside on one side of the first thermal module* recited in claim 32 is not supported by the disclosure as filed, arguing that the term *at least two* is open-ended, and that Applicant’s figures show at most two second thermal modules on one side of a first thermal module. Claim 38 is rejected on similar grounds.

The specification as originally filed indicates that one advantage of the claimed system is that it is expandable, using such open-ended terms a “multiple parallel in plane elements” (Abstract) and “any number of in plane thermoelectric modules” (original claim 2) to

indicate that Applicant envisioned much larger arrays of components. Many other examples of such language can be found throughout the specification and claims as filed.

Applicant respectfully submits that *at least two of the plurality of second thermal modules resid[ing] on one side of the first thermal module* is adequately supported in the disclosure as filed.

Claim 33

The Office Action alleges that the limitation *the two second thermal modules that are on one side of the first thermal module are flexibly coupled to each other* is not supported in the disclosure as filed. Figure 2 (as originally filed and numbered) shows two modules 1 separated by an O-ring 2, which is a flexible element. Paragraph [0011] states that “[t]his embodiment allows all axis expansion, contraction and natural mechanical variance in stack elements in multi-up configurations.” Applicant respectfully submits that the specification discloses a flexible coupling between the modules.

Claim 34

The Office Action alleges that the limitation *the two second thermal modules that are on one side of the first thermal module are flexibly coupled to each other such that the second fluid flows through the respective second passages of both of the second thermal modules that are on one side of the first thermal module* is not supported by the disclosure as filed. As is explained above with respect to claim 33, the disclosure as filed does describe the thermal modules being flexibly coupled. Figure 2 also shows that the coupling is such that fluid can flow through the passages in the two modules.

Claim 35

The Office Action alleges that the limitation *a compliant member that seals between the two respective second passages* is not supported by the disclosure as filed. As is explained above, Figure 2 shows and paragraph [0011] describes an O-ring 2 that seals between the passages in two blocks. An O-ring is well known to be compliant.

Claims 36 and 37

The Office Action alleges that the limitations of *a compliant member between the two second thermal modules that are on one side of the first thermal module, and a mechanism*

that connects the two second thermal modules and applies pressure to the compliant member recited in claim 36 and the limitation that the mechanism is a dogleg feature recited in claim 37 are not supported in the disclosure as filed. As is explained above, the specification and drawings do describe O-ring 2, which is a compliant member between the thermal modules. The specification also recites that the system “has a dog leg feature that keeps adjacent blocks connected and applies pressure on the o-ring number 2.” (Specification paragraph [0011]). The dogleg feature is also shown in Figures 1 and 2. Figure 1 is reproduced below with added annotation, showing the locations of two dogleg features.

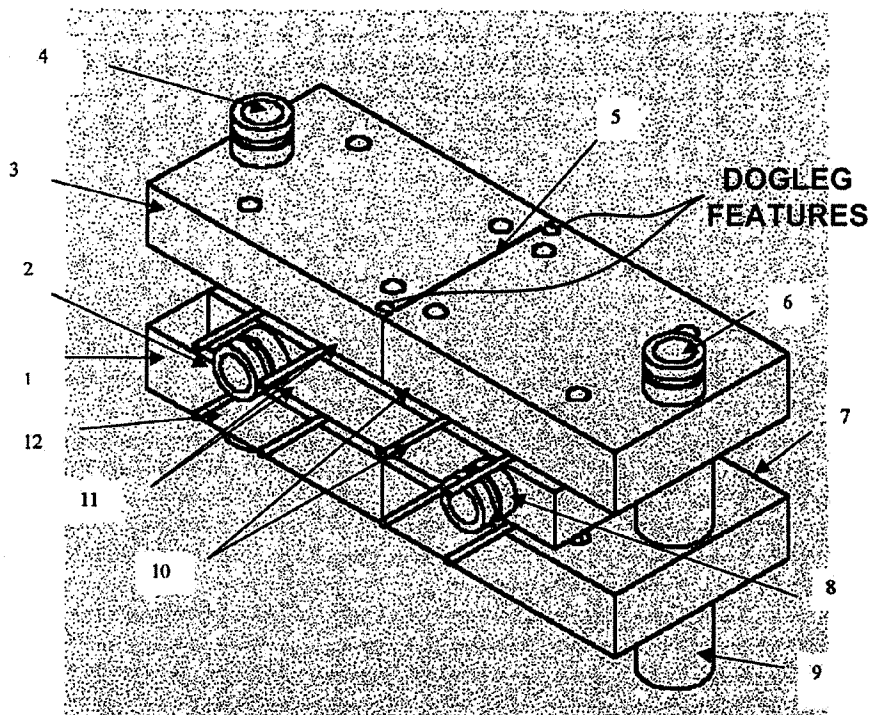


Figure 1.

Claim Rejections Under 35 U.S.C. § 102

Claims 8-15, 24-25, 27-28, 30-35 and 38 have been rejected under 35 U.S.C. § 102(b) as being allegedly anticipated by U.S. Patent No. 3,607,444 issued to DeBucs (“DeBucs”).

Although Applicant respectfully disagrees with the rejection and believes that the term *block* has been unreasonably broadly interpreted, claim 8 is amended in the interest of expediting allowance of the application to recite in part that

*the first thermal module comprises a first **substantially rigid** block including a first passage through which first passage the first fluid flows through the block*

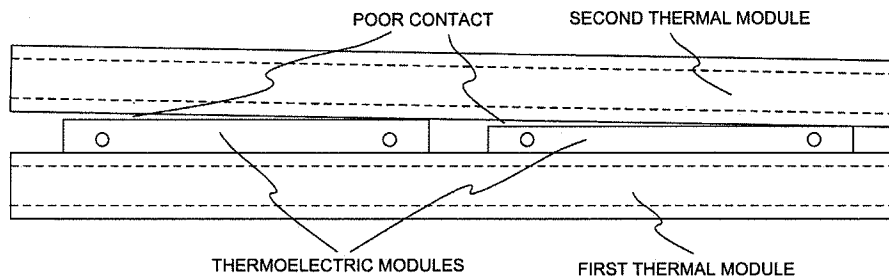
and that

*each of the plurality of second thermal modules comprises a respective **substantially rigid** second block including a respective second passage through which second passage the second fluid flows through the respective second block....*

Applicant recognizes that the specification does not explicitly describe the blocks as *substantially rigid*. However, the fact that the blocks are *substantially rigid* is implied throughout the specification, and implicit support for a claim term is sufficient to meet the requirements of 35 U.S.C. § 112. (MPEP 2163).

As is well known, efficient performance of a thermoelectric generator requires good thermal contact between the each thermoelectric module and the hot and cold thermal elements on the two sides of the thermoelectric module. Thermoelectric modules of the kind described in the present application have planar surfaces. (Figure 2).

Applicant describes an arrangement where multiple thermoelectric modules are in contact with a single planar face of a first thermal module (the center module shown in Figures 1 and 2). For efficient heat transfer, it is important that the second thermal modules (e.g. module 3 in Figure 1) on the other sides of the thermoelectric modules also make good thermal contact with the thermoelectric modules. If there is mechanical variation in the height of the thermoelectric modules, then a single rigid second thermal that tries to span two or more thermoelectric modules module may contact only corners or edges of the thermoelectric modules, and may not make good thermal contact across the planar faces of both thermoelectric modules. This situation is illustrated below.



Possible solutions to this problem alluded to in the specification include sorting parts into matching sets that can fit together with good thermal contact, or machining or lapping certain parts to fit. (Abstract). For example, if the top surfaces of the two thermoelectric modules shown above were to be made coplanar, then the two thermoelectric modules could be sandwiched between the two rigid thermal modules with good thermal contact at all planar surface interfaces.

Another possible approach is to make one of the thermal modules compliant and not rigid. This is the approach taken by DeBucs. If one of the thermal modules is compliant, then multiple thermoelectric modules can be pressed between two thermal modules, and good contact assured by the compliant thermal module conforming to any variations in height between the thermoelectric modules.

By contrast, Applicant describes and claims a different approach. Applicant's substantially rigid second thermal modules are separate blocks so that a side of each contacts only one thermoelectric module. This allows the second thermal modules to be independently positioned to conform to the planar surfaces of the thermoelectric modules, making good thermal contact. In some embodiments, the blocks are flexibly coupled together for expandability, while still allowing good thermal contact.

If the blocks of Applicant's claims were not rigid, then there would be no need for the bifurcation of the second thermal module shown in Figure 1 and described in paragraph [0010]. The rigidity of the blocks is implicit in the disclosure because the need for the invention arises from the rigidity of the blocks.

Other parts of the specification provide additional implication of the rigidity of the blocks. For example, the performance of the thermoelectric generator depends on efficient heat transfer between the thermoelectric modules and the fluids flowing through the blocks. This implies that the blocks are made of a material with high thermal conductivity, such as a metal.

In another example, Applicant's O-ring 2 (as numbered in original Figure 2) is sandwiched between two of the second thermal modules, and pressure is applied to the O-ring using dogleg features. In order to adequately seal between the second thermal modules, the second thermal modules are made of a material with sufficient strength and rigidity that the dogleg features can maintain good compression on the O-ring.

Applicant respectfully submits that the specification provides ample implicit support for the substantial rigidity of the thermal module blocks.

As was agreed during the telephone interview, DeBucs does not disclose first and second thermal modules that are *substantially rigid* blocks, and thus does not anticipate claim 8 as amended. The remaining claims rejected on this ground depend from claim 8 and add further limitations, and are therefore also not anticipated for at least this reason.

It would also not be obvious to modify the system of DeBucs to use *substantially rigid* tubes because their compliance would be compromised, as would the principle of operation of DeBucs' system.

Rejections under 35 U.S.C. §103

Claim 26 has been rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over DeBucs as applied to claim 8 above. Claim 26 depends from claim 8 and adds further limitations. The Office Action relies on DeBucs to teach or suggest all of the limitations of claim 8. As is explained above, DeBucs fails to do so, and thus cannot support the rejection of claim 26 under 35 U.S.C. § 103(a).

Claims 16 and 36-37 have been rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over DeBucs as applied to claim 8 or 32 above, in view of U.S. Patent No. 4,564,504 to Sorber ("Sorber").

Claim 29 has been rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over DeBucs as applied to claim 28 above, and further in view of U.S. Patent 4,228,923 to Hed ("Hed").

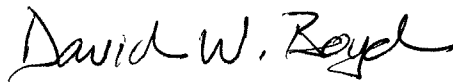
Each of claims 16, 29, 36, and 37 depends indirectly from claim 8 and adds further limitations. The Office Action relies on DeBucs to teach or suggest all of the limitations of claim 8. As is explained above, DeBucs fails to do so. The additions of Sorber and Hed do not cure the deficiencies of DeBucs, and claims 16, 29, 36, and 37 are believed allowable for at least this reason.

CONCLUSION

In view of the foregoing, Applicant believes all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 303-571-4000.

Respectfully submitted,



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Attachments
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